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ABSTRACT

The Illustrative Examples are a companion resource to Alberta Education's 1998 "Information and Communication Technology, Interim Program of Studies." Purposes of the examples are to: clarify the intent of the general and specific outcomes of the program of studies; suggest ways to integrate the general and specific outcomes with programs of study in the core subject areas for grades 10-12; and suggest tasks and activities that may help students achieve the outcomes within core subject areas. Each illustrative example includes a background or context, the task or activity, a scoring guide or rubric, specific outcomes, and related curriculum outcomes. Preceding the examples is an outline of information and technology general outcomes in the following categories: foundational operations, knowledge, and concepts; processes for productivity; and communicating, inquiring, decision making, and problem solving. (AEF)

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ED 429 569

ILLUSTRATIVE EXAMPLES TO ACCOMPANY
INFORMATION AND COMMUNICATION
TECHNOLOGY
INTERIM PROGRAM OF STUDIES



...are carrying a
federal tax burden. As we
\$25,000 pay a tax rate of
income, and 48 percent on the
the case of giant corporations
50 percent—adds up to an effective
million-dollar corporations are
ment!
Other important revenue
the private and...

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After January 25, 1999 the area code 403 becomes area code 780.

The primary intended audience for this interim program of studies is:

<i>Administrators</i>	✓
<i>Counsellors</i>	
<i>General Audience</i>	✓
<i>Parents</i>	✓
<i>Students</i>	
<i>Teachers</i>	✓

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INTRODUCTION

PURPOSE

The Illustrative Examples are a companion resource to the *Information and Communication Technology, Interim Program of Studies*, 1998. The purpose of these examples is to:

- clarify the intent of the general and specific outcomes of the program of studies
- suggest ways to integrate the general and specific outcomes with programs of study in the core areas across all grade levels
- suggest tasks and activities that may help students achieve the outcomes within core subject areas.

The illustrative examples provide sample tasks students can perform to demonstrate what they know and can do in relation to the technology and core subject outcomes. These illustrative examples also provide ways in which to view the technology outcomes, as many of them may be broadly interpreted. For example, students are expected to communicate through multimedia. There are a variety of ways to accomplish this, from incorporating visuals, such as posters or a slide show with an oral presentation, to creating an electronic multimedia presentation with a software program. The concept of communicating through multimedia is the critical outcome; how students demonstrate their understanding and skill with this can vary.

The illustrative examples demonstrate how the technology outcomes can be integrated within the context of the core curricular areas. Each example is cross-referenced to one or more curricular outcomes. There are also examples of cross-curricular integration (two or more curricula along with the technology outcomes). A list of the **current programs of study** that the curriculum outcomes were drawn from can be found in the references section of this document. As these programs of study change, the illustrated examples will need to be reviewed for their currency.

LOOKING AT TECHNOLOGY DIFFERENTLY

The goal of the program of studies is to enable our students to become:

- capable information and communication technology users
- information seekers, analyzers and evaluators
- problem solvers and decision makers
- communicators and collaborators
- informed, responsible and contributing citizens.

Technology has been defined as the processes, tools and techniques that alter human activity. While often much attention is paid to such tools as computers, productivity software and peripheral devices, when we speak of technology, there is a need to focus on the processes that provide us with the conceptual tools with which to live our lives and to do our work more efficiently and effectively. One approach is to distinguish between hard and soft technologies. **Hard technologies** refer to such tools as computer hardware and software, calculators, fax machines, television and radio, VCRs and other electronic devices. **Soft technologies** refer to such processes as information management, needs assessment, task analysis, data analysis, mind mapping, instructional design, time management and collaboration with others.

As well as knowing how to use and apply the hard technologies—the tools—students also need to understand and apply the soft technologies—the processes. Many of the illustrative examples require students to demonstrate their ability to apply tools and processes within a specific context or problem. Transferring these skills to new contexts or problems is also a very critical outcome to achieve. The illustrative examples provide a starting place. Teachers will want to create other tasks and activities that present different problems and contexts.

FORMAT FOR ILLUSTRATIVE EXAMPLES

Each illustrative example has three parts to it:

- a background, or context
- the task or activity
- a scoring guide, or rubric.

Background The background provides important information to help students understand the nature of the problem to be solved or the conditions guiding the task. Sometimes the background or context is written for the students and sometimes it is written for the teacher. When the background is written for the teacher it provides an overview of the general purpose for the task and/or the subject setting.

Task The task or activity may be as simple as answering a question or following a single step process. It may be complex and involve a series of steps or interrelated processes. It may be completed in a single lesson, or it may require many class periods to complete. The task may incorporate several technology and subject outcomes, and some tasks cross over several subjects. Most of the tasks require students to have learned specific skills already. The task then becomes a demonstration of what the students can do on their own. Students should be provided with the opportunity and time to learn the required skills prior to the introduction of the task, or the teacher

should use the task to help students learn what is expected. Many of the tasks are group activities that require students to work and collaborate with others.

Note: Task activities are suggestions only. Teachers are encouraged to modify the tasks to meet the needs and circumstances of their students. The availability of resources, such as software, computers and Internet connections, will determine which tasks are most appropriate. Student interest and readiness should also be taken into consideration.

Scoring guide The scoring guide or rubric, further clarifies what is expected of students by describing task assessment criteria. As tasks are designed to emphasize the technology learner outcomes, scoring guides generally provide only those criteria that match the specific outcomes listed. This type of scoring guide is called an **analytic rubric** and is most useful for instructional purposes. Teachers may want to develop scoring guides that also incorporate criteria matching the course subject area learner outcomes. This type of rubric is called **holistic**.

ONLINE DATABASE

The illustrative examples presented in this document also may be found in a searchable database on the Alberta Education web site at <http://ednet.edc.gov.ab.ca/technology>. Many of the illustrative examples include links to other web pages. As well, the 2Learn Alliance site provides a gateway to additional information and ideas. It can be found at <http://www.2Learn.ca>.

INFORMATION AND COMMUNICATION TECHNOLOGY

GENERAL OUTCOMES

FOUNDATIONAL OPERATIONS, KNOWLEDGE AND CONCEPTS

- F1** Students will demonstrate an understanding of the nature of technology.
- F2** Students will understand the role of technology as it applies to self, work and society.
- F3** Students will demonstrate a moral and ethical approach to the use of technology.
- F4** Students will become discerning consumers of mass media and electronic information.
- F5** Students will practice the concepts of ergonomics and safety when using technology.
- F6** Students will demonstrate a basic understanding of the operating skills required in a variety of technologies.

PROCESSES FOR PRODUCTIVITY

- P1** Students will compose, revise and edit text.
- P2** Students will organize and manipulate data.
- P3** Students will communicate through multimedia.
- P4** Students will integrate various applications.
- P5** Students will navigate and create hyperlinked resources.
- P6** Students will use communication technology to interact with others.

COMMUNICATING, INQUIRING, DECISION MAKING AND PROBLEM SOLVING

- C1** Students will access, use and communicate information from a variety of technologies.
- C2** Students will seek alternative viewpoints, using information technologies.
- C3** Students will critically assess information accessed through the use of a variety of technologies.
- C4** Students will use organizational processes and tools to manage inquiry.
- C5** Students will use technology to aid collaboration during inquiry.
- C6** Students will use technology to investigate and/or solve problems.
- C7** Students will use electronic research techniques to construct personal knowledge and meaning.

ILLUSTRATIVE EXAMPLES

ENGLISH LANGUAGE ARTS, GRADE 10

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|---|
| F2 | 4.7 | use current, reliable information sources from around the world |
| F3 | 4.3 | respect ownership and integrity of information |
| P4 | 4.2 | apply principles of graphic design to enhance meaning and audience appeal |
| P6 | 4.1 | select and use the appropriate technologies to communicate effectively with a targeted audience |
| C7 | 4.1 | use appropriate strategies to locate information to meet personal needs |

RELATED CURRICULUM OUTCOMES

English Language Arts 10

GO 3.2, All Bullets; GO 3.1, Bullet 4; GO 4.1, All Bullets

- select relevant personal and peer knowledge, experiences and perspectives related to inquiry or research topic
- identify and discuss the purpose and usefulness of specialized information sources [such as magazines, documentaries, hobby or sports materials, multimedia resources] relevant to particular inquiry or research needs
- determine the credibility, accuracy and completeness of a variety of information sources for a particular inquiry or research plan
- access information using a variety of tools and sources [such as electronic networks, libraries, taped oral histories]
- identify and use text cues and organizational patterns to understand main ideas and their relationships in extended texts; adjust reading and viewing rates according to purpose, content and context
- develop and use an inquiry or research plan to access relevant ideas and information from a variety of sources

General Outcomes: F2, F3, P4, P6, C7

STUDENT TASK

Background

This task could be revised for use in a film study unit.

Task

As part of a novel study or an independent reading assignment, select a book, by an author of your choice, that to your knowledge has not been made into a film. After reading the book, design a movie poster that will attract new readers, by accurately portraying the book without simply retelling the story.

The movie poster should include the following:

- a front that conveys a good sense of the movie/book theme
- a brief description/blurb of the movie/book theme
- appropriate quotes from respected critics
- your personal responses to the work
- interesting design symbolism to capture a major idea in the work
- use of colour
- current actors you believe would suit the characters.

Outline your strategy for locating the relevant information, and provide information about the author.

Use a variety of information sources, including electronic sources, to research the book and author. Use the capabilities of desktop publishing or other software to prepare the movie poster.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | – uses an appropriate search strategy that accesses pertinent and current sources |
| | – selects information thoughtfully from the sources used |
| | – creates a well-designed poster, with illustrations and text, in order to communicate the content accurately and effectively |
| 3 | – uses a search strategy that finds sufficient relevant information |
| | – selects information |
| | – creates a poster, with appropriate illustrations and text, in order to communicate the content accurately |

- generate and combine ideas from personal experiences and other sources to focus a topic appropriate for audience and purpose
- experiment with a variety of forms [such as reports, resumes, cover letters, dramatizations, visual representations, short stories] appropriate for content, audience and purpose
- select organizational structures and techniques to create oral, written and visual texts; use effective introduction, well-written body and effective conclusion to engage and sustain audience interest

- 2
 - identifies generalized rather than specific terms for the search
 - locates some of the information that is required
 - creates a poster with basic information and illustration
- 1
 - has difficulty in identifying appropriate search terms and sources
 - selects information that is not relevant to the task
 - creates a poster that is incomplete

ILLUSTRATIVE EXAMPLES
ENGLISH LANGUAGE ARTS, GRADE 10

SPECIFIC OUTCOMES

The student will be able to:

- F3 4.1** demonstrate an understanding of how changes in technology can benefit or harm society

RELATED CURRICULUM OUTCOMES

English Language Arts 10

GO 2.2, Bullet 2; GO 2.2, Bullet 2

- respond personally and critically to individuals, events and ideas presented in a variety of Canadian and international texts
- respond personally and critically to ideas and values presented in a variety of Canadian and international texts

General Outcomes: F3**STUDENT TASK****Task**

Using a human rights issue drawn from a Social Studies 10 unit of study, prepare a persuasive essay, or discussion or debate, to sway public opinion to your view. In preparation for your writing, identify information you already have, and search out additional information on the topic that will support your view as well as counter arguments against your view. Include electronic sources in your search.

Base your selection of information on the following:

- its degree of authority
- its relevance, currency and accuracy
- its consideration of opposing points of view.

SCORING GUIDE

The student:

- 4 – uses wide-ranging and diverse information sources
– is highly discriminating in the selection of information sources
- 3 – accesses a variety of information sources, including electronic sources
– is selective in choices of information sources
- 2 – explores a limited selection of information sources, which may or may not include electronic sources
– accepts sources with little consideration of their appropriateness for the project
- 1 – does not access outside information sources
– has not considered appropriateness of sources

ILLUSTRATIVE EXAMPLES

ENGLISH LANGUAGE ARTS, GRADE 10

SPECIFIC OUTCOMES

The student will be able to:

- C5** 4.1 use telecommunications to pose critical questions to experts

RELATED CURRICULUM OUTCOMES

English Language Arts 10

GO 5.2, Bullets 1 and 3

- consider various ideas, evidence and viewpoints to expand understanding of texts, others and self
- discuss ways in which texts convey and challenge individual and community values and behaviours

General Outcomes: C5

STUDENT TASK

Study the influence that early cultural experience has on well-known Canadian writers, such as Michael Ondaatje, Timothy Findley, Margaret Laurence and Margaret Atwood. As part of your research, electronically contact, where possible, Canadian writers of varied cultural backgrounds to discuss how their background affects their work.

Use primary sources to conduct online discussions, where possible, or read autobiographies. Use secondary sources, such as biographies or interviews, to gain more information. Write a report of the information gathered. If online discussions were possible, include the text of the discussions as an appendix.

SCORING GUIDE

The student:

- 4 - accesses and retrieves information, independently, from Internet sources
- 3 - accesses and retrieves information, with some assistance, from Internet sources
- 2 - demonstrates limited ability to access and retrieve information from Internet sources
- 1 - is unable to develop a communication link, using Internet sources

ILLUSTRATIVE EXAMPLES

ENGLISH LANGUAGE ARTS, GRADE 10

SPECIFIC OUTCOMES

The student will be able to:

- P3**
- 4.1 select and use, independently, multimedia capabilities for presentations in various subject areas
 - 4.2 support communication with appropriate images, sounds and music
 - 4.3 apply general principles of graphic layout and design to a document in process

RELATED CURRICULUM OUTCOMES

English Language Arts 10

GO 2.3, Bullet 5; GO 3.3, Bullet 1

- create original texts to communicate ideas and enhance understanding of forms and techniques
- organize information using appropriate forms [such as charts, diagrams, outlines, electronic databases and filing systems, note] for specific purposes

General Outcomes: P3

STUDENT TASK

Background

This assignment could be adapted to use scenes from a novel instead of narrative poetry.

Task

Working in small groups, research a poem using electronic and print sources. Choose a narrative poem, such as Tennyson's *The Lady of Shalott*; a ballad, such as Keats' *La Belle Dame Sans Merci*; a dramatic monologue, such as Browning's *My Last Duchess*; or any other poem that lends itself to research that can be developed into an appropriate presentation.

Use appropriate technologies, e.g., computer software, scanners, audio or video equipment, to blend text, images, music and sounds in an original presentation that conveys the poetic elements in an effective multimedia form.

SCORING GUIDE

The student:

- 4 – selects and uses appropriate technology independently to create a sophisticated multimedia presentation
 - blends meaningful images, sounds and text, seamlessly, in an effective dramatization
 - uses layout and design principles to great effect
- 3 – selects and uses technology, with minor assistance, to create a multimedia presentation
 - incorporates images, sounds and text in a satisfactory dramatization
 - uses layout and design principles to create an acceptable effect
- 2 – uses technology, with considerable assistance, to create a limited multimedia presentation
 - incorporates some sounds, images and text but neglects the elements of drama
 - presents a design that has incongruent elements
- 1 – does not use technology to create a multimedia presentation
 - uses irrelevant images, sounds and text in a presentation that lacks dramatic elements
 - is haphazard in layout and design

ILLUSTRATIVE EXAMPLES

MATHEMATICS, GRADE 10

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|--|
| F1 | 4.2 | solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments |
| | 4.4 | demonstrate an understanding of the general concepts of computer programming and the algorithms that enable technological devices to perform operations and solve problems |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C7 | 4.2 | analyze and synthesize information to determine patterns and links among ideas |

RELATED CURRICULUM OUTCOMES

Pure Mathematics 10

Number Operations, C1-7, C1-8

- create and modify tables from both recursive and non-recursive situations [PS, T, V]
- use and modify a spreadsheet template to model recursive situations [PS, T, V]

General Outcomes: F1, P2, C7

STUDENT TASK

Background

Janet has decided to start an investment account at the local bank and selects a savings account that currently pays 5% per annum, compounded monthly. She initially invests the \$500 she received as an income tax rebate. She also plans to add \$100 per month to her account. The initial investment is to be made on April 1 of this year. The additional monthly \$100 investments are automatically made on the first day of each successive month. The monthly interest is deposited into the account on the last day of each month.

Task

1. Create a spreadsheet, using a predeveloped template, that will illustrate the growth of Janet's account over a 12-month period—April to March. The spreadsheet must contain the column headings: Month, Opening Balance, Interest Rate, Interest Earned, Additional Investment and Closing Balance. Print a copy of your spreadsheet.
2. Modify and print your spreadsheet to illustrate a change in the interest rate to 4.5% on November 1.
3. Janet received a raise in pay in July. Modify and print the spreadsheet developed in the first assignment to reflect a change in monthly investments from \$100 to \$150 beginning August 1.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | <ul style="list-style-type: none"> – completes the assignment accurately in the time allocated – prints a copy of the spreadsheet that displays the data accurately and clearly, with columns labelled appropriately – modifies the spreadsheet correctly to reflect the changes in interest rate and deposit amounts |
| 3 | <ul style="list-style-type: none"> – completes the assignment on time, with some assistance – prints a copy of the spreadsheet that displays correct data in table form, with columns labelled appropriately – modifies the spreadsheet correctly, with assistance, to reflect the changes in interest rate and deposit amounts |

- 2
 - completes the assignment in more than the allotted time and/or with considerable assistance
 - prints a copy of the spreadsheet that displays correct data for part 1) but incorrect data for part 2) and part 3)
 - cannot modify the spreadsheet to reflect the change in interest rate or increase in deposits
- 1
 - completes part 1) of the assignment
 - prints a display of the data for part 1), but it contains many errors
 - cannot modify the spreadsheet to reflect the change in interest rate or increase in deposits

ILLUSTRATIVE EXAMPLES

MATHEMATICS, GRADE 10

SPECIFIC OUTCOMES

The student will be able to:

- F1** 4.2 solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments
- C6** 4.4 generate new understandings of problematic situations by using some form of technology to facilitate the process
- C7** 4.2 analyze and synthesize information to determine patterns and links among ideas

RELATED CURRICULUM OUTCOMES

Pure Mathematics 10

Measurement, C3-4

- extend the concepts of sine and cosine for angles from 0 to 180 [R, T, V]

General Outcomes: F1, C6, C7

STUDENT TASK

Task

Using available technology, calculate and record the values, to four decimal places, of the following trigonometric ratios.

$\sin 70^\circ$
 $\sin 110^\circ$
 $\sin 47^\circ$
 $\sin 133^\circ$
 $\sin 69^\circ$
 $\sin 111^\circ$

$\cos 70^\circ$
 $\cos 110^\circ$
 $\cos 47^\circ$
 $\cos 133^\circ$
 $\cos 69^\circ$
 $\cos 111^\circ$

Summarize the patterns found in the trigonometric ratios of supplementary angles. Identify if there is a pattern between the tangent ratios of supplementary angles.

Use the patterns identified above to solve the following equations for $0 < \theta < 180$.

- a) $\sin \theta = 0.3267$
- b) $\sin \theta = 0.8593$
- c) $\cos \theta = 0.6481$
- d) $\cos \theta = -0.3719$
- e) $\tan \theta = 2.1847$
- f) $\tan \theta = -0.5915$

SCORING GUIDE

The student:

- 4 – calculates, correctly, the values of the trigonometric ratios for the given angles
- identifies and generalizes the patterns between the trigonometric ratios of supplementary angles
- identifies the pattern relating the tangent ratios of supplementary angles

- solves the trigonometric equations correctly, with no assistance, including identifying those that have more than one solution
- 3 - calculates, correctly, the values of the trigonometric ratios for the given angles
 - identifies the patterns between the trigonometric ratios of supplementary angles
 - identifies, with assistance, the pattern for the tangent ratios of supplementary angles
 - finds, correctly, one solution to each trigonometric equation but requires assistance to identify those equations having more than one solution
- 2 - calculates the trigonometric ratios for the given angles
 - is unable to identify the patterns between the trigonometric ratios of supplementary angles
 - is unable to identify the pattern for the tangent ratios of supplementary angles
 - requires assistance in solving the trigonometric equations
- 1 - requires assistance in calculating the trigonometric ratios for the given angles
 - cannot identify the patterns between the trigonometric ratios of supplementary angles
 - is unable to identify the pattern for the tangent ratios of supplementary angles
 - is unable to solve the trigonometric equations

ILLUSTRATIVE EXAMPLES

SCIENCE, GRADE 10

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|------------|--|
| F1 | 4.2 | solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments |
| P1 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |

RELATED CURRICULUM OUTCOMES

Science 10

Unit 1, Concept 2, Skill 2

- collect and graph data to show the effect of heat on the temperature of water

General Outcomes: F1, P1

STUDENT TASK

Background

It takes the addition of significant amounts of energy to defrost a freezer.

Task

Add thermal energy to a water and ice mixture at 0°C, and record the temperature every 30 seconds until the water is boiling and the temperature has stopped changing.

To complete this task:

- use appropriate software to generate a spreadsheet
- graph the data collected, labelling significant features; e.g., change of state
- present your findings in print form, importing your spreadsheet and graph, and commenting on the shape of the graph.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | - records and graphs the data accurately |
| | - labels areas of change of state |
| | - creates a clear and appropriately formatted document with an imported graph and spreadsheet |
| | - comments on the differences between areas of change of state and temperature from the graph |
| 3 | - records data and/or generates a graph with minor errors |
| | - labels areas of change of state |
| | - creates a word processor document, with an imported graph and spreadsheet, with minor format errors |
| | - comments on the shape of the graph but lacks detail |
| 2 | - records the data and produces a graph containing major errors |
| | - makes some attempt to label areas of change of state |
| | - creates a document with substantial help and no integration of graphics or data |
| | - makes some comments on the shape of the graph |
| 1 | - makes some display of the data |
| | - creates a limited document, generated with substantial help and no integration of graphics |

ILLUSTRATIVE EXAMPLES

SCIENCE, GRADE 10

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|---|
| F5 | 4.2 | identify safety regulations specific to the technology being used |
| P4 | 4.3 | use integrated software effectively and efficiently to reproduce work that incorporates data, graphics and text |

RELATED CURRICULUM OUTCOMES

Science 10

Unit 3, Concept 1, STS 1

- describe how WHMIS symbols are used to classify potentially hazardous materials; and explain the need for such systems to protect ourselves and the environment from harm

General Outcomes: F5, P4

STUDENT TASK

Task

Electronically produce a pamphlet—text and graphics—that demonstrates your understanding of safety in a high school science laboratory. Include in this pamphlet safety procedures and diagrams of all the required WHMIS symbols, with explanations.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | <ul style="list-style-type: none"> – identifies and explains, correctly, all required WHMIS symbols – identifies the essential safety procedures – creates a well-designed pamphlet that incorporates text and graphics |
| 3 | <ul style="list-style-type: none"> – identifies and explains all required WHMIS symbols with some inaccuracies – identifies most of the important safety procedures – creates a pamphlet that incorporates text and graphics |
| 2 | <ul style="list-style-type: none"> – identifies and/or explains, correctly, most WHMIS symbols – identifies several safety procedures – creates a pamphlet with text only |
| 1 | <ul style="list-style-type: none"> – identifies, correctly without explanation, most WHMIS symbols – identifies a few safety procedures – creates a pamphlet with assistance |

ILLUSTRATIVE EXAMPLES

SCIENCE, GRADE 10

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| F2 | 4.7 | use current, reliable information sources from around the world |
| P3 | 4.1 | select and use, independently, multimedia capabilities for presentations in various subject areas |
| P4 | 4.1 | integrate a variety of visual and audio information into a document to create a message targeted for a specific audience |
| C1 | 4.1 | plan and perform complex searches, using more than one electronic source |
| | 4.2 | select information from appropriate sources, including primary and secondary sources |

RELATED CURRICULUM OUTCOMES

Science 10

Unit 2, Concept 1, Knowledge 1

- identify and briefly describe the structure and function of the nucleus, nucleoid, endoplasmic reticulum, Golgi apparatus, lysosome, vacuole, mitochondrion, chloroplast, ribosome, cytoskeleton and cell wall, where present, in bacteria, plant and animal cells

General Outcomes: F2, P3, P4, C1

STUDENT TASK

Background

Detailed knowledge of cell organelles has been gained through the electron microscope and has greatly increased our understanding of cell function. Students should have already observed the cell, using a light microscope.

In this group activity, students search the Internet or other electronic resources to learn in greater detail about their assigned organelle(s). They make a multimedia presentation of this material to their classmates.

Task

Using a variety of electronic resources, research and present accurate information about your assigned organelle(s), citing your sources. In your presentation, diagrams, graphics and at least one micrograph should be included. Integrate your presentation, using at least three different media, such as Internet images, videos, CD-ROMs and overheads. Include a written summary.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | - researches at least three appropriate resources and cites them correctly |
| | - integrates into the presentation at least three different types of media |
| | - prepares a summary that is well designed, with all the content of the presentation included |
| 3 | - researches three different resources and cites appropriately |
| | - integrates into the presentation two different types of media |
| | - prepares a summary that is well designed, with most of the presentation's content included |
| 2 | - researches one or two different resources and cites appropriately |
| | - integrates into the presentation two different types of media |
| | - prepares a summary that includes some content of the presentation without details |
| 1 | - researches, but does not cite, one or two different resources |
| | - uses one type of media |
| | - includes no summary or the summary is of poor quality |

ILLUSTRATIVE EXAMPLES

SCIENCE, GRADE 10

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| F1 | 4.1 | assess the strengths and weaknesses of computer simulations in relation to real-world problems |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |

RELATED CURRICULUM OUTCOMES

Science 10

Unit 1, Concept 3, Skill 2 and Skill 7

- constructing and interpreting climate graphs
- compare weather forecasts to observe weather

General Outcomes: F1, P2

STUDENT TASK

Background

The maintenance of meticulous weather records over very long periods of time has given meteorologists and climate researchers the tools to monitor global climate changes. Researchers in all the scientific disciplines have known for some time that relationships between different sets of data often are only apparent when the data are compared in graphical form. The first signs of a greenhouse effect may appear in our long-term weather patterns.

Task

Using a local newspaper, weather office or Internet weather reports, create a spreadsheet of local weather forecasts for a region for a period of at least one calendar month; e.g., daily high and low temperatures, air pressure if reported, and precipitation. Compare the forecasts to actual reported weather conditions for those days.

In the word processing document that reports your investigation, incorporate:

- an effectively presented data table
- a spreadsheet with formulae for monthly averages of all the observations
- a representation of all the observations in the form of a single graph, made either directly from the spreadsheet or through combining separate graphs.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | – provides a word processing report complete with a spreadsheet, a table and a clearly labelled graph of the observations, with no more than one or two minor errors |
| 3 | – provides a word processing report complete with a spreadsheet, a table and a clearly labelled graph of the observations, with three or more minor errors |
| 2 | – provides a word processing report complete with a spreadsheet, a table and a poorly labelled graph of the observations, with some serious errors of fact/omission |
| 1 | – provides a handwritten report, with or without a spreadsheet, a table and a labelled graph of the observations, with some serious errors of fact/omission |

ILLUSTRATIVE EXAMPLES

SOCIAL STUDIES, GRADE 10

SPECIFIC OUTCOMES

The student will be able to:

- F2 4.7** use current, reliable information sources from around the world

RELATED CURRICULUM OUTCOMES

Social Studies 10

Topic B, Theme 3a

- examine rights (individual and collective) in Canadian society: human, civil, legal, minority, economic, cultural, language, political
- examine responsibilities in Canadian society: political (franchise), legal (jury duty), moral (respect for the rights of others), social participating in community activities; e.g., volunteering
- citizens can be involved and participate in society

General Outcomes: F2

STUDENT TASK

Background

Canada belongs to a number of international organizations, one of which is the United Nations (UN). The UN provides a forum for the nations of the world to work cooperatively with one another.

Task

Using the Internet to conduct research, create a one- or two-page document or flyer that outlines the membership and purpose of the following:

- General Assembly
- Security Council
- Secretariat.

SCORING GUIDE

The student:

- 4 – gathers accurate data, in an efficient manner, from appropriate sources on the Internet
 - creates a document or flyer, incorporating graphics and text, that effectively communicates all the information that is necessary
- 3 – gathers data from several sources on the Internet
 - creates a document or flyer, incorporating text and some graphics, that communicates most of the information that is necessary
- 2 – gathers some data from a source on the Internet
 - creates a document or flyer, with text only, that communicates some of the information that is necessary
- 1 – does not gather any data from any source on the Internet
 - does not create a completed document or flyer

ILLUSTRATIVE EXAMPLES

ENGLISH LANGUAGE ARTS, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- P3**
- 4.1 select and use, independently, multimedia capabilities for presentations in various subject areas
 - 4.2 support communication with appropriate images, sounds and music
 - 4.3 apply general principles of graphic layout and design to a document in process

RELATED CURRICULUM OUTCOMES

English Language Arts 20

GO 2.3, Bullets 1, 3, 4 and 5; GO 4.2, Bullet 2

- analyze how various forms and genres are used for particular audiences and purposes
- demonstrate understanding of how vocabulary and idiom affect meaning and impact; use appropriate vocabulary when discussing and creating texts
- experiment with language, visuals, and sounds to convey intended meaning and impact
- create original texts to communicate ideas and enhance understanding and techniques
- analyze and revise drafts to ensure appropriate content and to enhance unity, clarity and coherence

General Outcomes: P3

STUDENT TASK

Background

This task is comprehensive and involves:

- awareness of the key elements of *MacBeth*
- use of multimedia software
- knowledge of advanced technology skills, such as superimposing and blending a multimedia product
- use of effective speaking techniques.

This task would be appropriate for an academic challenge class, or to provide enrichment in the regular program.

Task

As a culminating activity to the study of *MacBeth*, prepare an effective presentation for your classmates. The presentation will incorporate multiple-media forms, such as printed text, still visual, and video and audio recording, from a variety of sources. The purpose of this task is to demonstrate how the use of multimedia technology can enhance a modern audience's appreciation of a 16th century drama. Remain true to the artistic integrity of the work. In an oral presentation, explain why you chose to use the particular forms you did and whether or not you achieved the purposes you intended.

SCORING GUIDE

The student:

- 4 – demonstrates multimedia and graphic layout capability through a seamless blending of prepared multimedia products, including original material
 - has chosen images, graphic layout, sound and music that demonstrates thoughtful and purposeful use of media
- 3 – demonstrates multimedia graphic layout capability through a combination of prepared multimedia products, including original material
 - has chosen images, graphic layout, sound and music that are appropriate to the task
- 2 – demonstrates multimedia and graphic layout capability with some lapses in coherence
 - incorporates images, graphic layout, sound or music into the presentation

- | | |
|---|--|
| 1 | <ul style="list-style-type: none">– uses multimedia forms and graphic layouts that are not clearly related to content and/or purpose– does not include images, graphic layout, sound or music |
|---|--|

ILLUSTRATIVE EXAMPLES

ENGLISH LANGUAGE ARTS, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- P3** 4.1 select and use, independently, multimedia capabilities for presentations in various subject areas
- 4.3 apply general principles of graphic layout and design to a document in process
- P4** 4.3 use integrated software effectively and efficiently to reproduce work that incorporates data, graphics and text

RELATED CURRICULUM OUTCOMES

English Language Arts 20

GO 3.1, Bullets 3 and 4; GO 4.2, Bullets 1, 3 and 5

- explore group knowledge and strengths to determine inquiry or research topic, purpose, and procedures
- develop, use and adapt an inquiry or research plan appropriate for content, audience, purpose, context, sources and procedures
- appraise own choices of ideas, language use and forms relative to purpose and audience and provide others with constructive appraisals
- use appropriate text features to enhance legibility for particular audiences, purposes, and contexts
- use appropriate strategies and devices to enhance the clarity and appeal of presentations

General Outcomes: P3, P4

STUDENT TASK

Background

This task is designed for use in a literature study unit. It will fit best with a work that has a historical context, such as *MacBeth* or *The Crucible*.

Task

As part of a literature study unit, work in small groups to create a newspaper that reflects the time period and the language used in a particular work. Your newspaper or magazine should address some of the issues that emerge from the particular literature that you are studying. These issues may include a historical/cultural contextualization, exploration of character motivations and actions, themes that the story develops, or any other issues relevant to the literature.

Visual layout should resemble that of actual newspapers, now or in the past. Photographs or other graphics should be incorporated as appropriate.

Articles in the newspaper should include both factual and interpretive information. National and local news stories, editorials, letters and even advertisements, where appropriate, may constitute the text of your publication.

Revise and edit your work carefully for public sharing.

Be prepared to present your newspaper electronically as well as in the traditional format. You may use the presentation software of your choice. As well, you may choose to create a video or multimedia presentation that adds aural elements to your product.

SCORING GUIDE

The student:

- 4 – creates a layout/presentation that is visually engaging, effective and strongly coherent
 - incorporates visual displays that appropriately enhance understanding of text
 - develops an electronic presentation that is engaging, seamlessly coherent and effective
- 3 – creates a layout/presentation that is visually pleasing, well-organized and connected
 - incorporates visual displays to support textual content

Division 4

- develops an electronic presentation that is clear and complete
- 2 - creates a layout/presentation that is perfunctory and lacks clarity of organization
 - incorporates visual displays that may falter in their support of text
 - attempts an electronic presentation, but clarity of communication is marginal
- 1 - creates a layout/presentation that is distracting, disorganized or incomplete
 - does not use visual displays, or uses displays that do not clearly connect to text
 - does not attempt an electronic presentation, or develops one that is unclear or otherwise problematic

ILLUSTRATIVE EXAMPLES

ENGLISH LANGUAGE ARTS, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|---|
| P5 | 4.1 | create multiple-link documents appropriate to the content of a particular topic |
| | 4.2 | post multiple-link pages on the World Wide Web or on a local or wide area network |
| P6 | 4.1 | select and use the appropriate technologies to communicate effectively with a targeted audience |
| C7 | 4.3 | use appropriate presentation software to demonstrate personal understandings |

RELATED CURRICULUM OUTCOMES

English Language Arts 20

GO 4.4, Bullets 1 and 2; GO 4.2, Bullet 4

- demonstrate confidence when presenting ideas and information; revise presentations as needed for subsequent occasions
- use appropriate voice and visual production factors to communicate and emphasize intent in personal and public communication
- use effective language, visuals and sounds, and arrange ideas for emphasis and desired effect

General Outcomes: P5, P6, C7

STUDENT TASK

Background

This task is designed as a cumulative task toward the end of the term. Students are expected to draw from literature studied during the term. This task could be completed as an individual or group activity. It deals with the concept of symbol, but other literary concepts might be appropriate.

Task

Explore your personal understanding of symbol. Select one symbol from a particular piece of literature that you have studied this term. Plan a presentation—lesson, seminar, workshop—in which you teach the concept and your understanding of that particular symbol.

Your presentation may include some or all of the following:

- placing the symbol within the context of the literature chosen
- identification of how that symbol is developed
- your assessment of the effectiveness of that symbol in conveying meaning.

Use presentation software in developing your project. Incorporate appropriate audio and visual information to enhance your presentation.

Make this presentation in the classroom setting, but also share it more widely, by transferring it to an online medium. Your presentation is to contribute to a pool of information on symbol.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | posts, independently, the completed product online for shared access |
| | – integrates a variety of audio and visual information to enhance the message of the product |
| | – communicates the intended message effectively |
| 3 | posts, with minimal assistance, the completed product online for shared access |
| | – integrates audio and visual information purposefully into the product |
| | – communicates the intended message adequately and well |
| 2 | experiences difficulty in posting the completed product online |

Division 4

- integrates some audio and visual information into the product
 - communicates the intended message, but clarity is lacking
- 1
- does not post the product online
 - does not integrate either audio or visual information
 - does not communicate the intended message

ILLUSTRATIVE EXAMPLES
ENGLISH LANGUAGE ARTS, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| P4 | 4.1 | integrate a variety of visual and audio information into a document to create a message targeted for a specific audience |
| P5 | 4.1 | create multiple-link documents appropriate to the content of a particular topic |
| | 4.2 | post multiple-link pages on the World Wide Web or on a local or wide area network |
| P6 | 4.1 | select and use the appropriate technologies to communicate effectively with a targeted audience |
| C7 | 4.3 | use appropriate presentation software to demonstrate personal understandings |

RELATED CURRICULUM OUTCOMES

English Language Arts 23
 GO 4.4, Bullets 1 and 2

- demonstrate confidence when presenting ideas and information; revise presentations as needed for subsequent occasions
- use appropriate voice and visual production factors to communicate and emphasize intent in personal and public communication

General Outcomes: P5, P6, C7

STUDENT TASK**Task**

As your contribution to an anthology of poetry, choose one poem from the poetry that you have written this year.

Prepare a presentation that will include the following:

- the text of the original poem
- an explanation of the poem
- your reading of the poem
- a visual that will connect to and enhance the meaning of your poem.

Use presentation software in developing your performance. Incorporate appropriate audio and visual information to enhance your presentation; e.g., you might include musical background to a taped reading of the poem.

Make this presentation in the classroom setting, but also share it more widely, by transferring it to an online anthology database.

The presentation is to be shared with the class, using multimedia presentation software.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | – posts, independently, the completed product online for shared access |
| | – integrates a variety of audio and visual information to enhance the message of the product |
| | – communicates the expression of the poem effectively |
| 3 | – posts, with minimal assistance from others, the completed product online for shared access |
| | – integrates audio and visual information purposefully into the product |
| | – communicates the expression of the poem adequately and well |
| 2 | – experiences difficulty in posting the completed product online |
| | – integrates some audio and visual information into the product |
| | – communicates the expression of the poem |
| 1 | – does not post the product online |
| | – does not integrate either audio or visual information |
| | – does not communicate the expression of the poem |

ILLUSTRATIVE EXAMPLES

ENGLISH LANGUAGE ARTS, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| P3 | 4.2 | support communication with appropriate images, sounds and music |
| C1 | 4.1 | plan and perform complex searches using more than one electronic source |
| C2 | 4.1 | consult a wide variety of sources that reflect varied viewpoints on particular topics |
| | 4.2 | evaluate the validity of gathered viewpoints against other sources |
| C3 | 4.1 | assess the authority, reliability and validity of electronically accessed information |
| | 4.2 | demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic |

RELATED CURRICULUM OUTCOMES

English Language Arts 23

GO 2.3, Bullets 1, 3, 4 and 5

- analyze how various forms and genres are used for particular audiences and purposes
- demonstrate understanding of how vocabulary and idiom affect meaning and impact; use appropriate vocabulary when discussing and creating texts
- experiment with language, visuals and sounds to convey intended meaning and impact
- create original texts to communicate ideas and enhance understanding and techniques

General Outcomes: P3, C1, C2, C3

STUDENT TASK

Background

Students need to know how to use tools, skills and strategies effectively to manage the volume of information available. Through the research process, students develop skills and strategies for lifelong learning. Students learn to analyze texts and consider such factors as author, purpose, audience and source. Daily news events can be accessed immediately through the use of the Internet. Students can read from a local, national or international perspective.

Task

Conduct a search on the Internet to study perspectives and biases of different electronic news sources. Examine a current news event of international interest as it is portrayed in several electronic newspapers. Read from local, national and international perspectives and from newspapers with recognized biases or focuses. Identify and discuss the purpose and usefulness of the information sources relevant to the particular inquiry or research. Evaluate how perspectives and biases influence the choice of information sources for inquiry or research.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | - conducts a successful search of a variety of local, national and international news services |
| | - provides a well-reasoned evaluation, with supporting evidence, of the biases and perspectives of the news sources that were found |
| 3 | - conducts a search of local, national and international news services that leads to the identification of at least one source in each category |
| | - provides a reasonable evaluation of the biases and perspectives of at least two news sources |
| 2 | - conducts a search that leads to at least one news source being found |
| | - provides a commentary on the biases and perspectives of at least one news source |
| 1 | - is not able to conduct a search without considerable assistance |
| | - provides a description of the viewpoint expressed from a news source |

ILLUSTRATIVE EXAMPLES

MATHEMATICS, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|---|
| P4 | 4.3 | use integrated software effectively and efficiently to reproduce work that incorporates data, graphics and text |
| P6 | 4.1 | select and use the appropriate technologies to communicate effectively with a targeted audience |
| C7 | 4.2 | analyze and synthesize information to determine patterns and links among ideas |

RELATED CURRICULUM OUTCOMES

Mathematics 20

Number Operations, N14

- solve budget problems using graphs and tables to communicate solutions [C, PS, T, V]

Statistics and Probability, SP8

- design different ways of presenting data and analyzing results, by focusing on the truthful display of data and clarity of presentation [C,CN,T,V]

General Outcomes: P4, P6, C7

STUDENT TASK

Task

In a group of two or three students, research the annual budget for your town, city or municipal district. This information may be on an Internet web site or available in a print form from your municipal district, town or city office. Determine the categories used to identify expenses, as well as the amount spent in each area. Enter the collected data into a spreadsheet, and produce an appropriate graph to represent the per cent of expenses allocated to each category. Electronically, prepare a brochure for taxpayers, outlining the budget categories and expenses. This brochure should contain a description of the categories, the table of data collected and the graph of the distribution of expenses. The municipality has determined that it needs to cut total expenses by 5%. From your findings, identify the categories where the budget could be reduced. Justify your selection.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | <ul style="list-style-type: none"> – completes the assignment in the negotiated time frame – enters the collected data and labels into the spreadsheet and creates the appropriate graph, labelled with categories and per cent distribution – produces a well-designed brochure, incorporating required elements – identifies areas of funding cuts and justifies the selection |
| 3 | <ul style="list-style-type: none"> – completes the assignment within the negotiated time frame – enters the collected data and produces the graph – produces a brochure displaying limited design characteristics and incorporating most of the required elements – identifies areas where cuts may be made but is unclear in justifying the selection |
| 2 | <ul style="list-style-type: none"> – completes the assignment in more than the negotiated time frame – produces the spreadsheet and/or graph – does not produce a brochure – does not make valid suggestions for areas to be cut |
| 1 | <ul style="list-style-type: none"> – collects the relevant data but does not complete the assignment – does not produce a completed spreadsheet or graph – does not display information in a brochure format – does not select any areas for budget cuts or identifies, without any justification, areas to be cut |

ILLUSTRATIVE EXAMPLES

MATHEMATICS, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- F1** 4.2 solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments
- C7** 4.2 analyze and synthesize information to determine patterns and links among ideas

RELATED CURRICULUM OUTCOMES

Mathematics 20

Variables and Equations, PR31

- solve nonlinear equations, using a graphing tool [CN, T, V]

General Outcomes: F1, C7

STUDENT TASK

Background

We have used a graphical method for determining the solution to a system of equations. The points of intersection of two graphs identify the ordered pairs that each equation shares. For example, in order to solve the system $y = x^2$, $y = 2x$, you may plot both functions on one coordinate grid and identify the points where the graphs intersect. This system may also be solved by equating the functions ($x^2 = 2x$), rearranging ($x^2 - 2x = 0$), and finding the points where the graphs of $y = x^2 - 2x$ and $y = 0$ intersect (the x-intercepts of $y = x^2 - 2x$).

Task

Using computer graphing software, determine three methods of solving the equation $2x - x^2 - 35x = 50$. Print your graphs; and, in paragraph form, describe how the solutions may be found from each graph. Show, algebraically, that the three methods produce identical solutions. Identify which graphical method is least likely to produce errors in reading solutions.

Identify the relationship between the maximum number of solutions to a system of equations and the degree of the equations in the system. Generate a system of equations that has solutions $(-3,0)$, $(0,0)$ and $(4,0)$. Describe the various ways that your system of equations could be solved graphically.

SCORING GUIDE

The student:

- determines three variations of the equation
 - graphs and prints graphs of three different systems of equations
 - analyzes and synthesizes information to identify the solution set from each system of equations
 - analyzes and synthesizes information to clearly identify and justify the method least likely to produce interpretation errors
 - identifies, correctly, the relationship between the degree of the equations and the maximum number of solutions
 - generates a nonlinear system of equations that has the solutions given, as well as variations on the system producing comparable solutions
- determines three systems of equations

- graphs and prints the graphs of three systems of equations
 - analyzes and synthesizes information to determine the solutions from each system of equations
 - provides an unclear explanation for the selection and justification of the most appropriate method
 - identifies, correctly, the relationship between the degree of the equations and the maximum number of solutions
 - generates a nonlinear system of equations that has the solutions given, as well as generating, with assistance, variations on the system producing comparable solutions
- 2
- is unable to determine three equivalent systems of equations without assistance
 - uses graphing tools to graph given systems of equations
 - identifies the solutions from the graphs, when asked to identify the points of intersection
 - is unable to identify the method that would produce the fewest interpretation errors
 - has difficulty identifying the relationship between the degree of the equations and the maximum number of solutions
 - cannot generate a nonlinear system of equations that has the solutions given nor generate variations on the system producing comparable solutions
- 1
- is unable to determine a system of equations to solve this equation
 - is able to graph a system of equations given the equations
 - is unable to identify the solutions from the graphs, when asked to identify the points of intersection
 - is unable to identify a method that would produce the fewest interpretation errors
 - cannot identify the relationship between the degree of the equations and the maximum number of solutions
 - cannot generate a nonlinear system of equations that has the solutions given nor generate variations on the system producing comparable solutions

ILLUSTRATIVE EXAMPLES

MATHEMATICS, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- F1** 4.2 solve and mathematical scientific problems by selecting appropriate technology to perform calculations and experiments
- C7** 4.2 analyze and synthesize information to determine patterns and links among ideas

RELATED CURRICULUM OUTCOMES

Mathematics 20

Variables and Equations, PR30

- solve systems of linear equations in two variables: algebraically (elimination and substitution), graphically [CN, PS, T, V]

General Outcomes: F1, C7

STUDENT TASK

Task

Jill wants to purchase a new car. She has narrowed her choices to two vehicles. Car "A" has an initial cost of \$15 000 and projected annual operating costs of \$2 500. Car "B" has an initial cost of \$20 000 and annual operating costs of \$1 800. Jill is concerned about the total cost of purchase and operating costs over the period of ownership.

Construct a set of linear equations to represent the total cost of purchase and operation for n years. Using a graphing technology, graph the equations for Car "A" and Car "B" on the same coordinate grid. Based upon your graphs, make your recommendation to Jill, taking into account the factors contributing to total cost.

Solve the system of equations algebraically to verify the information collected from your graphs.

SCORING GUIDE

The student:

- 4 – determines the equations correctly and plots the graphs using graphing tools
 - identifies, correctly, the point of intersection of the graphs
 - interprets the results correctly and makes recommendations based on the intended length of ownership
 - solves the system of equations algebraically and verifies the point of intersection of the graphs
- 3 – determines the equations and plots the graphs of the system of equations, but makes some slight errors
 - makes faulty identification of the point of intersection of the two graphs because of slight errors in creating the graphs
 - makes a recommendation for the purchase of the car, but the justification is unclear
 - solves the system of equations algebraically
- 2 – plots the graphs accurately or with slight errors, given the equations, using a graphing tool
 - has difficulty identifying the point of intersection of the two graphs
 - cannot interpret the results or make a recommendation
 - cannot solve the system of equations algebraically without assistance

- | | |
|---|--|
| 1 | <ul style="list-style-type: none"> - plots the graphs, given the equations, but cannot identify the point of intersection - offers no recommendation - cannot solve the system of equations algebraically, even with assistance |
|---|--|

ILLUSTRATIVE EXAMPLES

MATHEMATICS, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|--|
| F1 | 4.2 | solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C6 | 4.3 | manipulate data by using charting and graphing technologies in order to test inferences and probabilities |

RELATED CURRICULUM OUTCOMES

Mathematics 20

Number Operations, N15

- plot and describe data of exponential form, using appropriate scales [C,T,V]

General Outcomes: F1, P2, C6

STUDENT TASK

Task

A bacteria sample with a starting population of 500 doubles every five hours. Create a function to determine the total population as a function of time in hours. Using appropriate technology, set up a table of values, generated by the function, and graph the population versus time. From your graph, determine the approximate time at which the population will reach 10 000.

If the temperature of the environment is reduced by 5°C, the doubling time increases from five hours to seven hours. Modify your function, and generate a new graph reflecting this change. Determine how much longer it will take for the population to grow to 10 000.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | – constructs a table of values and plots a graph showing the proper population growth |
| | – constructs the equation linking total population and time |
| | – modifies the equation and plots the graph of the modified population growth |
| | – calculates the additional time required for the population to reach 10 000 |
| 3 | – has difficulty determining the equation of population growth |
| | – builds a table of values and plots a graph from the equation |
| | – determines the time required for the population to reach 10 000 |
| | – modifies the table of values and produces a graph for the modified conditions |
| | – produces the modified equation given the original equation |
| | – calculates the additional time required for the population to reach 10 000 |
| 2 | – creates the table of values and plots the graph |
| | – builds the equation, with assistance |
| | – determines the time required for the population to reach 10 000 |

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- modifies the table of values and produces a new graph reflecting the changing conditions
 - produces the modified equation, with assistance
 - is unable to determine the additional time required for the population to reach 10 000
- 1 - is unable to build a table of values, equation or graph

ILLUSTRATIVE EXAMPLES

BIOLOGY, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| F2 | 4.1 | use technology outside formal classroom settings |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| P5 | 4.1 | create multiple-link documents appropriate to the content of a particular topic |
| | 4.2 | post multiple-link pages on the World Wide Web or on a local or wide area network |
| P6 | 4.1 | select and use the appropriate technologies to communicate effectively with a targeted audience |

RELATED CURRICULUM OUTCOMES

Biology 20, Unit 3, Concept 1, Skill 1 and 2

- perform a field study and measure, quantitatively, appropriate abiotic factors, such as temperature, precipitation, snow depth, ice thickness, light intensity, pH, hardness and oxygen content in an aquatic and a terrestrial ecosystem; and present the data in a form, such as graphs, tables or charts, that describe, in general terms, the abiotic structure of the ecosystem chosen
- performing a field study and measuring, quantitatively and qualitatively, appropriate biotic and abiotic factors in the aquatic or terrestrial ecosystem chosen, and presenting the data in a form that describes, in general terms, the structure of the ecosystem; e.g., pH, temperature, precipitation, hardness, oxygen content, humidity, invertebrates, vertebrates, plants

General Outcomes: F2, P2, P5, P6

STUDENT TASK

Background

An ecosystem is a system where there is interaction between abiotic and biotic factors. In this activity, you will be performing a field study and collecting and measuring several abiotic factors in an aquatic environment, using data acquisition computer software and probes. You will collect the data at several different times, e.g., over a three-day period, and then prepare data tables, spreadsheets, graphs and/or charts that describe the abiotic structure of an aquatic ecosystem.

This data should be assembled in a database that could be placed on a web site. The intent is to build a database of information on the aquatic ecosystems of Alberta. This database is to be freely accessible to teachers and students in other jurisdictions around Alberta, as well as to interested scientists. Opportunities should be made available for this information to be expanded, updated and refined by other school groups over time.

Task

Your task is to:

- identify at least five abiotic factors that are crucial to an aquatic environment
- create a database that could be made available on the Internet.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | - creates a well-designed electronic database, using collected data |
| | - incorporates text, graphics, diagrams and graphs appropriately in an "Internet-ready" document |
| | - identifies at least five abiotic factors |
| 3 | - creates, with assistance, an electronic database, using collected data |
| | - incorporates text, graphics, diagrams and/or graphs in an "Internet-ready" document |
| | - identifies five abiotic factors |
| 2 | - collects some data and, with assistance, compiles the data in a database or chart |
| | - incorporates text, or graphics, or diagrams, or graphs in an "Internet-ready" document |
| | - identifies, from an information search, three or four abiotic factors |

- 1 – collects some data, with assistance
- uses text appropriately to display data, but not charts, graphs or diagrams, for an “Internet-ready” document
- identifies, from an information search, less than three abiotic factors

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|--|
| F1 | 4.2 | solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments |
| F2 | 4.1 | use technology outside formal classroom settings |
| C3 | 4.2 | demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic |

RELATED CURRICULUM OUTCOMES

Chemistry 20, Unit 2, Concept 1, Skill 2

- perform experiments to test the validity of the assumptions contained in stoichiometric methods, by, for example, predict reaction results, then measure the amount of product obtained from a reaction and calculating the per cent yield

General Outcomes: F1, F2, C3

STUDENT TASK

Background

Stoichiometric calculations are a sound empirical means of estimating the quantities of products and/or reactants in a chemical reaction.

Task

In this group project, your task is to analyze graphically, by means of a spreadsheet, a set of class results for a test of the stoichiometric method. The analyzed data can take many forms. Ideally, the data would be the mass of dry product obtained from a suitable chemical reaction, e.g., a thermal decomposition.

Your word processing report of this investigation should include:

- a spreadsheet that shows the initial data; predicted results; the formulas, if any, used; the actual results; and the percentage yield
- a labelled computer-generated scatterplot of the predicted and the actual data
- a statement revealing whether or not the stoichiometric method is valid; have the computer calculate a correlation coefficient, and use this to determine validity.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | - creates a spreadsheet containing the data requested
- develops a correctly labelled scatterplot of the predicted and measured data
- generates a correlation coefficient and statement about the validity of the stoichiometric method |
| 3 | - creates a spreadsheet with a few calculation errors
- develops a correctly labelled scatterplot of the predicted and measured data
- generates a correlation coefficient and statement about the validity of the stoichiometric method |
| 2 | - creates a spreadsheet with computational errors
- generates a scatterplot of the predicted and measured data
- generates a correlation coefficient but no validity statement |
| 1 | - creates a spreadsheet only, with many computational errors |

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|--|
| P1 | 4.1 | continue to demonstrate the learner outcomes achieved in prior grades and course subjects |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |

RELATED CURRICULUM OUTCOMES

Chemistry 20, Unit 1, Concept 3, Skill 1

- draw and interpret graphs of experimental data that relate pressure and temperature to gas volume

General Outcomes: P1, P2

STUDENT TASK

Background

Boyle's law describes the relationship between the pressure and the volume of a fixed quantity of gas at constant temperature; e.g., when air leaves a balloon or scuba diving tank, it expands.

Task

Using suitable methods, record in graphic and tabulated form the change in pressure of a fixed quantity of gas at constant temperature as its volume is manipulated.

The word processing document that reports your investigation is to incorporate:

- tabulated data
- a computer-generated graph of pressure (P) versus volume (V)
- a second graph showing the relationship between $1/P$ or $1/V$ versus V or P, respectively
- a simple explanation of the shape of the second graph
- an extrapolation of the graphs through the origin and comments on the difference between real and ideal gases.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | - produces a word processing report complete with computer-generated tables and graphs
- includes an appropriate explanation for the shape of the second graph, which includes no more than minor errors |
| 3 | - produces a word processing report complete with computer-generated graphs and tables
- includes a partially correct explanation for the shape of the second graph, which includes many errors |
| 2 | - produces a word processing report complete with computer-generated graphs and tables
- does not include an explanation for the shape of the second graph |
| 1 | - produces a handwritten report with graphs and tables
- does not include an explanation for the shape of the second graph |

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|------------|--|
| P1 | 4.1 | continue to demonstrate the learner outcomes achieved in prior grades and course subjects. |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |

RELATED CURRICULUM OUTCOMES

Chemistry 20, Unit 1, Concept 3, Skill 1

- draw and interpret graphs of experimental data that relate pressure and temperature to gas volume

General Outcomes: P1, P2

STUDENT TASK

Background

Charles' law describes the relationship between the volume and the temperature of a fixed quantity of gas at constant pressure.

Task

Using an air bubble trapped under light oil and the means of measuring its volume, record the change in volume of a fixed quantity of gas at constant pressure as its temperature is manipulated. Report your observations in both graphic and tabulated form.

The word processing document that reports your investigation must incorporate:

- tabulated data
- a computer-generated graph of volume (V) versus temperature (T, in °C)
- a second graph showing the relationship between volume (V) versus temperature (T, in °K)
- the name for the relationship illustrated by the second graph.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | - produces a word processing report complete with computer-generated graphs and tables |
| | - includes the correct name for the relationship illustrated by the second graph, which includes no more than minor errors |
| 3 | - produces a word processing report complete with computer-generated graphs and tables |
| | - includes the correct name for the relationship illustrated by the second graph, but the graph may have several errors |
| 2 | - produces a word processing report with computer-generated graphs and tables |
| | - does not include the name for the relationship illustrated by the second graph, and the graph is incomplete or missing |
| 1 | - produces a handwritten report with graphs and/or tables |
| | - does not include the name for the relationship illustrated by the second graph, and the graph is incomplete or missing |

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- F2** 4.7 use current, reliable information sources from around the world
- F3** 4.2 record relevant data for acknowledging sources of information and cite sources correctly

RELATED CURRICULUM OUTCOMES

Chemistry 20, Unit 4, Concept 1, STS 1

•compares examples of organic and inorganic compounds, where they are found and how they are used in processes and products common to everyday life

General Outcomes: F2, F3

STUDENT TASK

Background

Plastic is used to package all manner of household goods. Six polymers constitute the bulk of the material incorporated in household plastic packaging. Since there is no commercial market for mixed plastics, numbers from one through six adorn all plastic packaging to aid recycling depots.

Task

Using a suitable source of information, electronic or otherwise, identify which polymer corresponds to a given recycling number. Armed with this information, perform an audit of the plastic packaging products in your household.

The word processing document that reports your investigation is to incorporate:

- a computer-generated database of information outlining the frequency of each of the plastic types and their uses in your household
- a computer-generated bar or pie chart illustrating the relative frequencies/numbers of each plastic used in your household
- a second bar or pie chart illustrating the relative frequencies/numbers of each plastic used in the average household, according to industry sources
- a short discussion of any similarities or differences between the two charts.

SCORING GUIDE

The student:

- 4 – produces a word processing report complete with computer-generated charts and tables
 - includes an appropriate discussion of any similarities/differences between the household and industry data, with no more than minor errors
- 3 – produces a word processing report complete with computer-generated charts and tables
 - includes a discussion of the similarities/differences between the household and industry data, but many errors have been made
- 2 – produces a word processing report with charts and tables
 - does not include a discussion of the similarities/differences between the household and industry data

Division 4

- 1 – produces a handwritten report with charts and/or tables
- does not include any industry data and collects minimal household data

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| F1 | 4.1 | assess the strengths and weaknesses of computer simulations in relation to real-world problems |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C4 | 4.1 | use calendars, time management or project management software to assist in conducting an inquiry |

RELATED CURRICULUM OUTCOMES

Chemistry 20, Unit 3, Concept 3, Skill 2

- design and perform an experiment to illustrate the gas laws, which identify and control variables

General Outcomes: F1, P2, C4

STUDENT TASK

Background

Under standard conditions, either standard temperature and pressure (STP) or standard ambient temperature and pressure (SATP), one mole of any near ideal/low molar mass gas occupies about the same volume, namely the molar volume—22.4 L at STP or 24.8 L at SATP. If a sample of a gas is manufactured and its temperature, volume and pressure are measured/calculated, a simple application of the gas laws will allow determination of that gas' molar volume.

Task

Prepare and trap a sample of gas in an audiometer over water, and measure its volume, pressure and temperature, estimated from the air and water temperature. Construct a spreadsheet that converts the observations, including corrections for water vapour, into the molar volume of the trapped gas at STP or SATP.

The word processing document that reports your investigation is to incorporate:

- a table of observations and computed results
- a working/efficient spreadsheet that automatically calculates molar volume from entered data.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | – provides a word processing report, complete with an efficient and working spreadsheet and a table with no more than minor errors |
| 3 | – provides a word processing report, complete with a spreadsheet that works with a small amount of difficulty or inefficiency and a table with no more than minor errors |
| 2 | – provides a word processing report, complete with a spreadsheet that works only with great difficulty and a table with many errors |
| 1 | – provides a handwritten report, with or without a spreadsheet that works only with great difficulty and a table with many errors |

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| F1 | 4.1 | assess the strengths and weaknesses of computer simulations in relation to real-world problems |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C4 | 4.1 | use calendars, time management or project management software to assist in conducting an inquiry |

RELATED CURRICULUM OUTCOMES

Chemistry 20, Unit 1, Concept 2, Knowledge, Bullets 3 and 4

- describe the relationship between pH and hydrogen concentration
- calculate whole number pH values from hydrogen ion concentration, and hydrogen ion concentration from whole number pH values

General Outcomes: F1, P2, C4

STUDENT TASK

Background

The acidity of any substance is communicated most conveniently as a pH. More properly, the pH of a substance measures the concentration of hydrogen—hydronium ions—in an aqueous solution of a substance. Household chemicals are usually either acidic, $\text{pH} < 7$, or basic, $\text{pH} > 7$.

Task

Measure the pH of a variety of common household chemicals; e.g., vinegar, apple juice, orange juice, milk, liquid soap and tap water. Construct a spreadsheet, with appropriate formulae, which converts the observed pH readings into the molar concentration of hydrogen ions in each substance.

The word processing document that reports your investigation is to incorporate:

- a table of observations and computed results
- a working/efficient spreadsheet that automatically calculates $[\text{H}^+(\text{aq})]$
- two graphs representing the pH and $[\text{H}^+(\text{aq})]$ values of each household substance.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | - provides a word processing report complete with an efficient/working spreadsheet, a table and two graphs with no more than minor errors |
| 3 | - provides a word processing report complete with a spreadsheet that works with some difficulty or inefficiency, a table and two graphs with no more than minor errors |
| 2 | - provides a word processing report complete with a spreadsheet that works only with the teacher's help, a table and two graphs with many errors |
| 1 | - provides a handwritten report without a spreadsheet or with a spreadsheet that does not work, a table and two graphs with many errors |

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| F1 | 4.1 | assess the strengths and weaknesses of computer simulations in relation to real-world problems |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| P3 | 4.2 | support communication with appropriate images, sounds and music |
| C4 | 4.1 | use calendars, time management or project management software to assist in conducting an inquiry |

RELATED CURRICULUM OUTCOMES

Chemistry 20, Unit 3, Concept 1, Knowledge Bullet 4

- determine the polarity of a molecule based on simple structural shapes and unequal charge distribution

General Outcomes: F1, P2, P3, C4

STUDENT TASK

Background

Lewis dot diagrams, VSEPR theory and Pauling electronegativities can be used to predict the polarities of small molecules, generally with fewer than ten atoms. Once the polarity of several molecular substances is known, it is usually possible to indicate the relative order of their boiling and/or melting points with some confidence.

Task

Use a dedicated drawing program or the draw function of a "works"-type package to draw faithful representations, with perspective, of the following bonding arrangements: AX and AX₂ (linear), AX₂ (V-shaped), AX₃ (trigonal planar), AX₃ (trigonal pyramidal) and AX₄ (tetrahedral). Craft a short essay that integrates your bonding diagrams into the body of a word processing document, discussing the polarity of these bonding arrangements.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | - produces a word processing report complete with well-drawn diagrams located appropriately in the text and no more than minor errors |
| 3 | - produces a word processing report complete with diagrams located appropriately in the text, though some could be drawn better, and a few minor errors |
| 2 | - produces a word processing report complete with poorly drawn or inappropriately located diagrams in the text and many errors |
| 1 | - produces a mixed handwritten/word processing report complete with poorly drawn, inappropriately located or missing diagrams in the text and many errors |

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| F1 | 4.1 | assess the strengths and weaknesses of computer simulations in relation to real-world problems |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C4 | 4.1 | use calendars, time management or project management software to assist in conducting an inquiry |

RELATED CURRICULUM OUTCOMES

Chemistry 20, Unit 1, Concept 3, Skill 3

- perform and evaluate an experiment to determine molar mass from gaseous volume

General Outcomes: F1, P2, C4

STUDENT TASK

Background

Beginning in the 17th and 18th centuries, gas law chemistry proved itself most helpful in allowing natural philosophers to delve into the essential nature of the particles that formed the gas phase of matter.

Task

Trap a sample of gas, e.g., propane delivered from a cylinder or butane from a cigarette lighter, in an audiometer over water, and measure its mass, volume, pressure and temperature, estimated from the air and water temperature. Construct a spreadsheet that converts the observations, including corrections for water vapour, into the molar mass of the trapped gas.

The word processing document that reports your investigation is to incorporate:

- a table of observations and computed results
- a working/efficient spreadsheet that automatically calculates the molar mass of the gas from the data.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | – provides a word processing report, complete with an efficient/working spreadsheet and a table with no more than minor errors |
| 3 | – provides a word processing report, complete with a spreadsheet that works with a small amount of difficulty or inefficiency and a table with no more than minor errors |
| 2 | – provides a word processing report, complete with a spreadsheet that works only with great difficulty and a table with many errors |
| 1 | – provides a handwritten report, with or without a spreadsheet that works only with great difficulty and a table with many errors |

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|--|
| F1 | 4.1 | assess the strengths and weaknesses of computer simulations in relation to real-world problems |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C3 | 4.2 | demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic |
| C4 | 4.1 | use calendars, time management or project management software to assist in conducting an inquiry |

RELATED CURRICULUM OUTCOMES

Chemistry 20, Unit 2, Concept 1, Knowledge 4

- use gravimetric, solutions and gas stoichiometry to predict the quantities of reactants/products involved in chemical reactions

General Outcomes: F1, P2, C3, C4

STUDENT TASK

Background

The stoichiometric method makes it possible to calculate the mass of reactants and/or products in a quantitative chemical reaction. Prior to performing a chemical reaction, it is customary to calculate the mass/volume/concentration of a product expected so that the quality of the experimental yield/method can be gauged.

Task

Construct a spreadsheet that converts a range of reactant masses in a simple reaction, e.g., the thermal decomposition of malachite or a suitable hydrate, into a predicted mass. A graphical form of the spreadsheet calculations is used to analyze the quality of a set of class results.

The word processing document that reports your investigation is to incorporate:

- a table of reactant masses and computed results
- a working and efficient spreadsheet that automatically calculates the predicted mass
- a graph of predicted versus reactant mass for the reaction under investigation.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | - provides a word processing report complete with an efficient and working spreadsheet, a high quality graph and a table with no errors |
| 3 | - provides a word processing report complete with a spreadsheet that works, a high quality graph and a table with no more than one or two minor errors |
| 2 | - provides a word processing report complete with a spreadsheet that works only with great difficulty, a poor quality graph and a table with several errors |
| 1 | - provides a handwritten report with or without a spreadsheet that works only with great difficulty, a poor quality graph and a table with many errors |

ILLUSTRATIVE EXAMPLES

PHYSICS, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| F1 | 4.2 | solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments |
| F2 | 4.1 | use technology outside formal classroom settings |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C6 | 4.1 | investigate and solve problems of prediction, calculation and inference |
| | 4.2 | investigate and solve problems of organization and manipulation of information |

RELATED CURRICULUM OUTCOMES

Physics 20, Unit 3, Concept 1, Skill 1

- design and perform an experiment to demonstrate that simple harmonic motion can be observed in objects within certain limits, and relate the frequency and period of the motion or physical characteristics of the system; e.g., a mass on a light, vertical spring or a simple pendulum

General Outcomes: F1, F2, P2, C6

STUDENT TASK

Background

Simple harmonic motion (SHM) is defined as motion toward a fixed point, with an acceleration, owing to a restoring force, that is proportional to the displacement from the equilibrium position.

Task

Perform an experiment that determines those variables that affect the frequency/period of an object in simple harmonic motion (SHM). Choose either a simple pendulum or a vertical spring and manipulate all likely variables that could affect the frequency/period of SHM.

Include in the report of your investigation:

- a spreadsheet containing frequency/period, oscillating mass, length of support—simple pendulum—or displacement from equilibrium—spring
- a graph of the relationship between frequency, or period, and one variable that affects frequency/period of oscillation
- an identification of the manipulated, responding and controlled variables.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | – sets up a correctly labelled spreadsheet, with the data accurately entered |
| | – uses an appropriate graph to display the data |
| | – can identify the manipulated, responding and controlled variables |
| 3 | – sets up a correctly labelled spreadsheet, with some inaccuracies in data entry |
| | – uses an appropriate graph to display the data |
| | – can identify manipulated, responding and controlled variables with assistance |
| 2 | – records data in a spreadsheet inaccurately |
| | – uses a graph that inappropriately displays the data |
| | – identifies the manipulated, responding and controlled variables inaccurately |
| 1 | – does not complete the graph and spreadsheet |
| | – cannot identify any of the variables |

ILLUSTRATIVE EXAMPLES

SOCIAL STUDIES, GRADE 11

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|---|
| F2 | 4.3 | demonstrate an understanding of new and emerging communication systems |
| | 4.7 | use current, reliable information sources from around the world |
| | 4.8 | analyze and assess the impact of technology on the global community |
| C1 | 4.2 | select information from appropriate sources, including primary and secondary sources |
| C2 | 4.1 | consult a wide variety of sources that reflect varied viewpoints on particular topics |
| C7 | 4.2 | analyze and synthesize information to determine patterns and links among ideas |

RELATED CURRICULUM OUTCOMES

Social Studies 20

Topic B, Theme 1b and 2d

- illustrate differing perspectives and factors that influence quality of life by comparing selected countries from Africa, Asia and the Americas: beliefs and values; e.g., religious, social and material, social structure, demography, environment, government policies, economic strategies

General Outcomes: F2, C1, C2, C7

STUDENT TASK

Background

Some individuals believe that the best way to measure "quality of life" is to adopt the model of a developed nation, such as Canada. These individuals point to Canada's high standard of living, material wealth and its highly developed industrial and technological base.

Others believe that "quality of life" can be measured by other standards, such as traditional values and beliefs, community standards and environmental considerations.

Still others believe that societies can incorporate contemporary and traditional ideas to ensure a better "quality of life".

Task

Your task is to investigate the lifestyles of an Alberta high school student and a high school student in a developing nation, in order to compare the Western emphasis on technological advancement with at least one other perspective.

In your investigation:

- identify and cite correctly traditional and electronic sources of information. Create a list of the resources that you used in completing your assignment
- find and record information on student lifestyles in at least one developed and one developing nation. This information may include the following:
 - standard of living
 - food choices and preferences
 - type of government
 - technological development
 - extent of industrialization
 - importance of traditional values and/or spiritual beliefs
 - community standards—laws and human rights legislation
 - environmental considerations
 - any other information related to "quality of life".

Write a 100- to 250 word report that compares and contrasts the lifestyle of an Alberta student with the lifestyle of a student in a developing nation:

- complete the student reflection sheet, which might include the following questions:

- How relevant and valid were the sources in completing your assignment?
- Did the electronic medium help you in your investigation?
- What were the advantages and disadvantages in using the electronic medium?
- Why is it important that you be able to discriminate between valid and relevant information and information that is not?

SCORING GUIDE

The student:

- 4
 - records information that is relevant and appropriate to the task
 - demonstrates a sophisticated understanding of the lifestyles investigated
 - completes the student reflection sheet in a thorough and thoughtful manner
 - identifies all traditional and electronic sources of information
- 3
 - records information that is relevant or appropriate to the task
 - demonstrates a broad understanding of the lifestyles investigated
 - completes the student reflection sheet in a thoughtful manner
 - identifies most traditional and electronic sources of information
- 2
 - records information that is related to the task
 - demonstrates a modest understanding of the lifestyles investigated
 - completes, for the most part, the student reflection sheet
 - identifies some traditional and electronic sources of information
- 1
 - records information that is incomplete
 - demonstrates a poor understanding of the lifestyles investigated
 - does not complete the student reflection sheet
 - identifies a few traditional and electronic sources of information

ILLUSTRATIVE EXAMPLES

ENGLISH LANGUAGE ARTS, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|--|
| F3 | 4.2 | record relevant data for acknowledging sources of information and cite sources correctly |
| F4 | 4.3 | identify and analyze a variety of factors that affect the authenticity of information derived from mass media and electronic communication |
| C1 | 4.1 | plan and perform complex searches using more than one electronic source |
| | 4.2 | select information from appropriate sources, including primary and secondary sources |
| C2 | 4.1 | consult a wide variety of sources that reflect varied viewpoints on particular topics |
| | 4.2 | evaluate the validity of gathered viewpoints against other sources |

RELATED CURRICULUM OUTCOMES

English Language Arts 30
GO 3.2, Bullets 1, 2, 4 and 5

- evaluate and select ideas and information from prior knowledge of inquiry or research topic appropriate for audience, purpose, and personal perspective or focus
- identify and discuss diverse information sources relevant to particular inquiry or research needs
- access information to accomplish a particular purpose within the topic parameters and time available
- use knowledge of text cues, organizational patterns, and cognitive and emotional appeals to extract, infer, synthesize, organize and integrate ideas from extended texts; adjust reading and viewing rates according to purpose, content and context

General Outcomes: F3, F4, C1, C2

STUDENT TASK

Task

As part of the media studies unit, select one film for extended study. Prepare a taped oral review of that film. The review should reflect your thoughts about the film, as well as opinions expressed in published reviews.

Your discussion should include the following:

- your response to some of the elements of the film; e.g., acting, action sequences, characterizations, film techniques and effective telling of the story
- references to critiques of the film from several reviewers.

In your research, you should consult a variety of sources, including more than one electronic source, that reflect critical viewpoints. Compare the critical commentary with your own personal responses. Hand in the completed audiotape, an outline of the research plan that you followed and a list of the resources from which you quoted.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | - develops a search plan that is precise and complete, and accesses several and varied electronic sources |
| | - retrieves several reviews with varying viewpoints |
| | - examines the differences in published viewpoints in relation to own viewpoint |
| 3 | - develops a functional search plan that accesses more than one electronic source |
| | - retrieves several reviews |
| | - identifies similarities and differences among viewpoints |
| 2 | - develops a search plan of limited scope; accesses one electronic source |
| | - retrieves only one review |
| | - makes a limited comparison of viewpoints |
| 1 | - does not develop a search plan, or develops a plan that lacks direction |
| | - does not include reference to published reviews |
| | - makes no visible comparison of viewpoints |

ILLUSTRATIVE EXAMPLES

ENGLISH LANGUAGE ARTS, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| F3 | 4.2 | record relevant data for acknowledging sources of information and cite sources correctly |
| | 4.3 | respect ownership and integrity of information |
| C1 | 4.1 | plan and perform complex searches using more than one electronic source |
| | 4.2 | select information from appropriate sources, including primary and secondary sources |
| C2 | 4.1 | consult a wide variety of sources that reflect varied viewpoints on particular topics |
| | 4.2 | evaluate the validity of gathered viewpoints against other sources |

RELATED CURRICULUM OUTCOMES

English Language Arts 30

GO 4.2, Bullet 5; GO 3.2, Bullets 1, 2, and 4;
GO 3.3, Bullet 2; GO3.2, Bullets 3 and 5; GO 4.2, Bullet 5

- use appropriate strategies and devices to enhance the impact of presentations
- select ideas and information from prior knowledge of inquiry or research topic appropriate for audience, purpose, and personal perspective or focus
- identify and discuss the purpose and usefulness of information sources relevant to particular inquiry or research needs
- access information using a variety of tools, skills, and sources to accomplish a particular purpose
- summarize and record information, ideas, and perspectives from a variety of sources; document sources accurately
- evaluate how perspectives and biases influence the choice of information sources for inquiry or research

General Outcomes: F3, C1, C2

STUDENT TASK

Task

As part of a literature study unit, select one of the authors for in-depth study. Prepare a research essay that reflects your learning about the author and his/her works.

Your essay should include the following:

- discussion of theme, style or content emphasis, or another significant element of the author's work
- pertinent biographical data, as it reflects on the content of the author's work
- identification of significant works, including the work studied in class, as they reflect the discussion of theme, style and content emphasis
- your personal response to the work studied
- critical commentary of the work studied or the author's body of work as it reflects themes, style and content emphasis.

In your research, you should consult a variety of sources, including more than one electronic source, which reflect varied critical viewpoints. Compare critical commentary with your own personal responses.

Your finished essay should be formatted appropriately. Include a research plan and a bibliography.

SCORING GUIDE

The student:

- | | | |
|---|---|---|
| 4 | - | uses a complex search strategy, accesses several electronic sources and accounts for all elements of the project |
| | - | revises the complex search strategies as required |
| | - | selects information thoughtfully—reflection on the nature of the sources and on the validity of gathered points of view is apparent |
| 3 | - | uses a functional search strategy, accesses more than one electronic source and identifies most key elements of the project |
| | - | completes the search |
| | - | selects information that is appropriately relevant and reflects varied viewpoints |
| 2 | - | uses a search strategy that incorporates a broad approach without an appropriate narrowing of focus; accesses an electronic source |
| | - | completes most aspects of the search |

- use knowledge of text cues, organizational patterns and persuasive techniques to sort and relate ideas in extended texts; adjust reading and viewing rates according to purpose, content and context
- use appropriate strategies and devices to enhance the clarity and appeal of presentation

- selects information that is generally relevant and that covers some of the requirements
- 1 – uses a search strategy that appears haphazard
- attempts several aspects of the search, and some are completed
- selects information that may not be relevant or that is somewhat incomplete

ILLUSTRATIVE EXAMPLES

MATHEMATICS, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- F1 4.2** solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments

RELATED CURRICULUM OUTCOMES

Mathematics 30

Transformations, SS38 to SS40

- describe how the various translations of functions affect graphs and their related equations
- describe how various stretches of functions (compressions and expansions) affect graphs and their related equations
- describe how reflections of functions in both axes and in the line $y = x$ affect graphs and their related equations

General Outcomes: F1

STUDENT TASK

Background

In this unit, you have graphed linear, quadratic and square root functions. You have also worked on transformations and reflections of graphs about the x -axis.

Task

Use a graphing calculator or graphing software to construct the graph of a wine glass as shown below.



You may use transformations of the functions covered in this unit, as well as what you know about reflections, to construct your wine glass. Hint: The wine glass is a symmetrical object. Indicate the required restrictions on the domain of each function to produce the glass. At the end of a one-hour period, hand in a printed copy of your wine glass, a list of the equations used to produce the graph, and a list of restrictions placed on the domain of each function to limit each curve sufficiently to produce the wine glass.

SCORING GUIDE

The student:

- 4 – completes the assignment independently within the time allocated
 - produces a graph that is clear with no overlap of curves
 - clearly outlines the equations used and the restrictions on the domain of each function
- 3 – completes the assignment with minimal assistance
 - produces a graph with minimal overlap of curves
 - identifies the transformations of the required function; the direction of the translation is correct, but there are minor errors in magnitude
 - identifies the restrictions on the domains of the functions, but more refinement may eliminate curve overlap

- 2
 - requires assistance to complete the assignment
 - indicates the functions required to construct the components of the glass but has difficulty in identifying the magnitude and direction of the translations
 - has difficulty in identifying the restrictions on the domains of the functions
- 1
 - does not complete the assignment
 - is unable to identify the equations of the components required to build the wine glass
 - is unable to identify the restrictions on the domains of the functions

ILLUSTRATIVE EXAMPLES

MATHEMATICS, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|--|
| F1 | 4.2 | solve mathematical and scientific problems by selecting appropriate technology to perform calculations and experiments |
| F2 | 4.2 | analyze how technological innovations and creativity affect the economy |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C6 | 4.2 | investigate and solve problems of organization and manipulation of information |
| C7 | 4.2 | analyze and synthesize information to determine patterns and links among ideas |

RELATED CURRICULUM OUTCOMES

Mathematics 30

Chance and Uncertainty, SP11

- find the population standard deviation of a data set or a probability distribution, using technology [CN, E, T, V]

General Outcomes: F1, F2, P2, C6, C7

STUDENT TASK

Task

The quality control coordinator for a local strand board mill measures the length and width of a sample of boards produced. The dimensions of a 122 cm by 245 cm board, measured to the nearest 0.01 cm, of a random sample of ten boards are given below.

122.88 by 245.76
 122.81 by 245.78
 122.85 by 245.71
 122.86 by 245.76
 122.89 by 245.73
 122.85 by 245.77
 122.86 by 245.75
 122.83 by 245.73
 122.86 by 245.78
 122.83 by 245.77

If the standard deviation of the sample exceeds 0.01 cm in either dimension, the production process must be shut down and adjustments made to that dimension.

Using an appropriate technology, determine if the standard deviation for each dimension is within the specified limits, and determine if the production process must shut down. If the shut-down is required, identify the adjustments that must be made.

The coordinator decides to use another criterion for determining the quality of the product. Instead of measuring the standard deviation of each dimension, he decides to measure the standard deviation of the area of the board. Discuss the advantages and disadvantages of this option from a mathematical perspective and from the perspective of the operation of the mill.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | - calculates the standard deviation of the lengths and widths of the sample data |
| | - has identified if a shut-down is required and clearly identifies which dimension requires the greatest adjustment |
| | - identifies numerous advantages and disadvantages of the second option of quality control |

- 3 – has calculated the standard deviation of the length and width
 - has identified if a shut-down is required but has not clearly indicated which dimension requires the most adjustment
 - identifies some advantages and disadvantages of the second option of quality control
- 2 – calculates the standard deviation but cannot interpret the results
 - is unable to identify any advantages or disadvantages of the second option
- 1 – is unable to calculate the standard deviation

ILLUSTRATIVE EXAMPLES

BIOLOGY, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| F3 | 4.1 | demonstrate an understanding of how changes in technology can benefit or harm society |
| | 4.2 | record relevant data for acknowledging sources of information and cite sources correctly |
| F4 | 4.3 | identify and analyze a variety of factors that affect the authenticity of information derived from mass media and electronic communication |
| P4 | 4.3 | use integrated software effectively and efficiently to reproduce work that incorporates data, graphics and text |
| C3 | 4.1 | assess the authority, reliability and validity of electronically accessed information |
| | 4.2 | demonstrate discriminatory selection of electronically accessed information that is relevant to a particular topic |

RELATED CURRICULUM OUTCOMES

Biology 30, Unit 2, Concept 3, STS 3

- discuss how knowledge of embryo/fetus development has influenced society's values on human life

General Outcomes: F3, F4, P4, C3

STUDENT TASK

Background

Cloning has been an essential and unremarkable component of plant reproductive technology for centuries. Developments in cloning technology in recent years have included remarkable advances in the cloning of animals.

Task

Identify, evaluate and assess the validity and reliability of several electronic sources of information regarding animal cloning technology.

Include in your report the following information:

- list at least six reference sources, with appropriate citation, that relate to animal cloning technology
- develop a means to evaluate the validity and reliability of the information sources
- comment on the accuracy of the information located
- present your findings, complete with graphics and charts as necessary
- recommend one information source as the most reliable and valid, and provide justification.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | – lists and cites six or more electronic reference sources |
| | – develops a sophisticated tool to evaluate the reliability and validity of the information |
| | – presents findings |
| | – selects and persuasively explains the choice of a recommended site |
| 3 | – lists and cites six electronic reference sources |
| | – develops, with some inconsistencies, a tool to evaluate the reliability and validity of the information |
| | – presents findings, with some assistance |
| | – selects, with reasonable explanation, a recommended site |
| 2 | – lists and cites three to five electronic reference sources |
| | – develops, with some inconsistencies, a basic tool to evaluate either the reliability or validity of the information |
| | – presents findings, with considerable assistance |
| | – selects, with little or no explanation, a recommended site |

- | | |
|---|---|
| 1 | <ul style="list-style-type: none">- lists and cites fewer than three electronic reference sources- develops, with considerable assistance, a simple tool to evaluate either the reliability or validity of information- presents findings, with considerable assistance, using primarily text without graphics- does not select a recommended site |
|---|---|

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- P2** 4.1 manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets

RELATED CURRICULUM OUTCOMES

Chemistry 30, Unit 1, Concept 1, Knowledge 7, STS 1

- uses a standard heats of formation table to predict heat of reaction for a chemical change
- provides examples of personal reliance on the chemical potential energy of matter; e.g., of fuels and identifying and evaluating ways of using energy more efficiently in the home and community in order to use natural resources judiciously to ensure adequate supplies for future generations

General Outcomes: P2

STUDENT TASK

Background

A plot of how the pH of an acid or base sample changes as it is titrated with a strong base or acid, respectively, is called a pH titration curve. These curves for the titration of a strong monoprotic acid with a strong base, or vice versa, can be analyzed to determine species concentration at various points on the curve.

Task

Use a suitable spreadsheet application to calculate the change in pH during the titration of 50 mL of a 0.10 mol/L strong monoprotic acid with a strong base of the same molar concentration.

The word processing document that reports the investigation is to incorporate:

- tabulated data showing the formula used to calculate each data point
- a fully labelled, computer-generated pH curve
- a balanced chemical equation describing the reaction.

SCORING GUIDE

The student:

- 4 – produces a word processing report complete with a labelled pH graph, table and the correct net acid–base equation with no more than minor errors
- 3 – produces a word processing report complete with a poorly labelled, computer-generated graph; table; and a net acid–base equation that may be incorrect
- 2 – produces a word processing report complete with a poorly labelled, computer-generated graph and table but an unsuitable net acid–base equation
- 1 – produces a hybrid word processing/handwritten report, possibly with a computer-generated graph and table but no net acid–base equation

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|--|
| F2 | 4.5 | demonstrate conservation measures when using technology |
| | 4.7 | use current, reliable information sources from around the world |
| F3 | 4.2 | record relevant data for acknowledging sources of information and cite sources correctly |
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C1 | 4.2 | select information from appropriate sources, including primary and secondary sources |

RELATED CURRICULUM OUTCOMES

Chemistry 30, Unit 1, Concept 1, Knowledge 7, STS 1

- uses a standard heats of formation table to predict heat of reaction for a chemical change
- provides examples of personal reliance on the chemical potential energy of matter; e.g., of fuels and identifying and evaluating ways of using energy more efficiently in the home and community in order to use natural resources judiciously to ensure adequate supplies for future generations

Chemistry 30, Unit 1, Concept 1, Knowledge 7; Unit 4, Concept 2, Skill 4, STS 4

- predict heats of combustion for different fuels, and uses heats of formation and Hess's law
- describe the ability and responsibility of society, through science and technology, to protect the environment and use natural resources judiciously to ensure quality of life for future generations; e.g., the commercial development of renewable and nonrenewable energy resources

General Outcomes: F2, F3, P2, C1

STUDENT TASK

Background

The economies in the developed nations, whether they be net fossil fuel producers or consumers, are influenced greatly by the cost of oil and by implication the cost of energy.

Task

Use a suitable spreadsheet application to calculate the enthalpy changes associated with the complete combustion of the common hydrocarbon fuels methane, propane, butane, hexane and octane. Calculate the cost of obtaining one gigajoule of energy from each of the fuels, using information on costs from industry/commercial/electronic sources.

The word processing document that reports the investigation is to incorporate:

- a spreadsheet showing the formula, if any, used to calculate each data point
- tabulated data of the molar enthalpy of combustion and cost per calculated gigajoule of energy
- a labelled, computer-generated bar chart of the relative cost of energy from each fuel
- a discussion of the most economic fuel and the most widely used fuel, based on calculated and industry data.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | - produces, with no more than minor errors, a word processing report complete with a suitable spreadsheet, on disk; computer-generated charts; tables; and an appropriate discussion of the most common and most economic fuels, based on calculated and industry data |
| 3 | - produces a word processing report, with many errors, complete with computer-generated charts and tables but an inappropriate discussion of the most common and most economic fuels, based on calculated and industry data |
| 2 | - produces a word processing report complete with computer-generated charts and tables but no discussion of the most common and most economic fuels, based on calculated and industry data |
| 1 | - produces a handwritten report, possibly with computer-generated charts and tables but no discussion of the most common and most economic fuels, based on calculated and industry data |

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|------------|--|
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C6 | 4.1 | investigate and solve problems of prediction, calculation and inference |
| C7 | 4.2 | analyze and synthesize information to determine patterns and links among ideas |

RELATED CURRICULUM OUTCOMES

Chemistry 30, Unit 3, Knowledge 7

- perform calculations to determine any of pH, pOH, $(\text{H}_3\text{O}^+(\text{aq}))$, $(\text{OH}^-(\text{aq}))$, K_a or K_b from the masses of solute, volumes and concentrations of solutions

General Outcomes: P2, C6, C7

STUDENT TASK

Background

Strong acids dissociate completely while weak acids dissociate partially. Using dynamic equilibrium theory, it is possible to calculate the pH of any weak acid given its measured acid dissociation constant and a suitable measure of concentration.

Task

Construct a spreadsheet that calculates, using both the approximation method and the quadratic method, the pH of 0.10 mol/L aqueous solutions of the first 12 weak acids, not including indicators, in the Relative Strengths of Acids and Bases Table in the *Alberta Education Chemistry 30 Data Booklet*.

The document that reports the investigation is to incorporate:

- a table of acid name, $\text{H}_3\text{O}^+(\text{aq})$ concentration, K_a and pH values
- a spreadsheet with the appropriate formulae
- a graphic representation of the tabulated data—scatterplot/bar graph or other suitable diagram.

SCORING GUIDE

The student:

- | | | |
|---|---|---|
| 4 | – | provides a report complete with good quality computer-generated graphic representation, a table and a spreadsheet with no more than minor errors |
| 3 | – | provides a report complete with good quality computer-generated graphic representation and a table but incorrect or inappropriate formulae in a spreadsheet |
| 2 | – | provides a report complete with poor quality computer-generated graphic representation and a table but incorrect or inappropriate formulae in a spreadsheet |
| 1 | – | provides a handwritten report with poor quality computer-generated graphic representation and a table but no spreadsheet |

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C6 | 4.1 | investigate and solve problems of prediction, calculation and inference |
| C7 | 4.2 | analyze and synthesize information to determine patterns and links among ideas |

RELATED CURRICULUM OUTCOMES

Chemistry 30, Unit 3, Knowledge 7

- perform calculations to determine any of pH, pOH, $(\text{H}_3\text{O}^+(\text{aq}))$, $(\text{OH}^-(\text{aq}))$, K_a or K_b from the masses of solute, volumes and concentrations of solutions

General Outcomes: P2, C6, C7

STUDENT TASK

Background

Perform calculations to determine any of pH, pOH, $[\text{H}_3\text{O}^+(\text{aq})]$, $[\text{OH}^-(\text{aq})]$, K_a or K_b from the masses of solute, volumes and concentrations of solutions.

Task

Compile a spreadsheet/database that can be used to represent the K_a and K_b dissociation constants of all the amphiprotic chemical entities in the Relative Strengths of Acids and Bases Table in the *Alberta Education Chemistry 30 Data Booklet*.

The word processing document that reports the investigation is to incorporate:

- a table of amphiprotic entity name, K_a and calculated K_b values
- a spreadsheet with the appropriate formulae for obtaining K_b
- a graphic representation of the tabulated data—scatterplot/bar graph or other suitable diagram.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | – provides a word processing report complete with good quality computer-generated graphic representation, a table and a working spreadsheet/database with no more than minor errors |
| 3 | – provides a word processing report complete with good quality computer-generated graphic representation and a table but incorrect or inappropriate formulae in a working spreadsheet/database |
| 2 | – provides a word processing report complete with poor quality computer-generated graphic representation and a table but incorrect or inappropriate formulae in a spreadsheet/database that functions poorly |
| 1 | – provides a handwritten report, possibly with poor quality computer-generated graphic representation and a table but no functioning spreadsheet/database |

ILLUSTRATIVE EXAMPLES

CHEMISTRY, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|-----------|-----|--|
| P2 | 4.1 | manipulate and present data through the selection of appropriate tools, such as scientific instrumentation, calculators, databases and/or spreadsheets |
| C6 | 4.1 | investigate and solve problems of prediction, calculation and inference |

RELATED CURRICULUM OUTCOMES

Chemistry 30, Unit 3, Concept 3, Skill 7

- draw and interpret titration curve graphs using data from titration experiments involving acids and bases in various combinations

General Outcomes: P2, C6

STUDENT TASK

Background

When a strong acid is neutralized by a strong base in water, there is a dramatic change in the numbers of ions present in solution and, hence, a change in the solution conductivity. A conductometric titration monitors the change in sample conductivity as titrant is added continuously from a burette.

Task

Using suitable conductivity probes and data-logging software, record in graphic and tabulated form the change in conductivity during the titration of a monoprotic strong acid with an equimolar strong base.

The document that reports the investigation is to incorporate:

- tabulated data
- a fully labelled, computer-generated conductometric titration graph, whereon the equivalence point is indicated appropriately.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | – provides a report complete with a clear and suitably labelled computer-generated conductometric titration graph and a table, with one or two minor errors |
| 3 | – provides a report complete with a labelled, computer-generated conductometric titration graph and a table, with several minor errors |
| 2 | – provides a report complete with an unlabelled, computer-generated conductometric titration graph and a table, with many errors |
| 1 | – provides a handwritten report with an unlabelled and unclear conductometric titration graph and a table, with many errors |

ILLUSTRATIVE EXAMPLES

PHYSICS, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- F2** 4.7 use current, reliable information sources from around the world

RELATED CURRICULUM OUTCOMES

Physics 30, Unit 1, Concept 2, STS 3

- investigates and reports on a technology developed to improve the efficiency of energy transfer in a response to reconcile the energy needs of society with its responsibility to protect the environment and to use energy judiciously

General Outcomes: F2

STUDENT TASK

Background

Many nations and corporations are investing considerable resources in technological innovations to improve the efficiency of energy transfer. Such innovations will result in making society's economy and the environment more sustainable.

Task

Create a multimedia presentation that provides an overview of the latest energy efficiency technologies being developed around the world, including developing nations.

SCORING GUIDE

The student:

- 4 – creates a well-designed multimedia presentation that effectively captures and holds the audience's attention
- 3 – creates a reasonable multimedia presentation that is interesting
- 2 – creates a multimedia presentation that is difficult to follow
- 1 – creates a presentation, using text and pictures only

ILLUSTRATIVE EXAMPLES

PHYSICS, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- F3 4.1** demonstrate an understanding of how changes in technology can benefit or harm society

RELATED CURRICULUM OUTCOMES

Physics 30, Unit 3, Concept 1, STS 2

- discuss contemporary developments in the areas of electricity and magnetism, and their immediate and potential impact on daily life; e.g., superconductivity

General Outcomes: F3

STUDENT TASK

Background

Superconductivity is a field of research that is expanding rapidly. The discoverers of lanthanum-based, high temperature ceramic superconductors were recent Nobel Prize winners. With the advent of "high temperature superconductivity", exciting developments in communications, transportation and electronic technologies cannot be far off.

Task

Use electronic reference sources to research the history of superconductivity, and emphasize at least four major events/breakthroughs in the development of superconductors. There are limitations in the application of superconductor technology. Identify at least two such limitations.

Use integrated software to create a report that incorporates text, graphic images, graphs and spreadsheets as necessary.

The report should include citations for your information sources.

SCORING GUIDE

The student:

- 4 – identifies in the report four or more major events and three or more limitations of superconductor technology, as well as the significance of this information
 - incorporates text, graphics, diagrams and graphs appropriately into the report
- 3 – identifies one or two major events and limitations and their significance
 - incorporates limited text, graphics and graphs
- 2 – identifies or explains one or two major events and limitations, with brief explanations of their significance
 - incorporates text with graphics or diagrams only
- 1 – identifies one major event or limitation only
 - uses the word processor only, with no integration of graphics or diagrams

ILLUSTRATIVE EXAMPLES

PHYSICS, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|---|
| F2 | 4.5 | demonstrate conservation measures when using technology |
| | 4.7 | use current, reliable information sources from around the world |
| P5 | 4.1 | create multiple-link documents appropriate to the content of a particular topic |
| | 4.2 | post multiple-link pages on the World Wide Web or on a local or wide area network |
| P6 | 4.1 | select and use the appropriate technologies to communicate effectively with a targeted audience |
| C1 | 4.1 | plan and perform complex searches using more than one electronic source |
| | 4.2 | select information from appropriate sources, including primary and secondary sources |
| | 4.3 | evaluate and explain the advantages and disadvantages of various search strategies |

RELATED CURRICULUM OUTCOMES

Physics 30, Unit 1, Concept 1, STS 1; Unit 3, Concept 3, STS 1; Science 30, Unit 4, Concept 4, Skill 1

- investigate and report on the application of conservation principles in research and design
- evaluate the risks and benefits of using electromagnetic radiation in technological solutions to practical problems; in terms of the quality of life, the limitations of science and technology, and societal needs, interests and financial support
- research the potential of tidal power, and uses library resources, newspaper articles or the Internet

General Outcomes: F2, P5, P6, C1

STUDENT TASK

Background

The tides in the Bay of Fundy are among the largest tides in the world. Some scientists and environmentalists suggest that these tides can be used as an alternative source of energy for Nova Scotia and possibly the Maritimes and the Eastern seaboard.

Task

Using three or more electronic references, research the potential of tidal power in the Bay of Fundy. With this information, create a web page that uses text, graphics, charts, audio/video and hyperlinks, and add this to your school web page, if available.

Include the following criteria:

- list at least three different electronic sources
- describe the source of tidal energy
- describe the transformation of energy from the source to the final output of electrical energy, using conservation laws
- evaluate and explain the advantages and disadvantages of the different search strategies
- present this report, using appropriate software, to a general audience on the World Wide Web.

SCORING GUIDE

The student:

- | | |
|---|---|
| 4 | – uses three or more electronic sources |
| | – shows and explains all the energy transformations from source input to final output of electrical energy |
| | – integrates text, graphics, data tables, video/audio in the web page |
| | – evaluates and explains at least two advantages and disadvantages of the different electronic sources |
| | – creates a web page, including graphics, and uploads to a web site with little or no help |
| 3 | – evaluates and explains only two advantages and disadvantages of the different electronic sources |
| | – creates a web page, including text and graphics, and uploads to a web site with significant help |
| | – uses only three electronic sources |
| | – shows and explains, with minor inconsistencies, all the energy transformations from source input to final output of electrical energy |

-
- integrates text, graphics, data tables, but no others in the web page
- 2
- uses two or three electronic sources
 - shows and explains the energy transformations from source input to final output of electrical energy but misses one or two transformations
 - uses only text in the web page
 - evaluates but gives no explanation of one or two advantages or disadvantages of the different electronic sources
 - creates a web page, including text and graphics, but is not able to upload to a web site without significant help
- 1
- gives no evaluation or explanation of the advantages and disadvantages of different electronic sources
 - creates a web page with considerable assistance but is not able to upload to a web site
 - uses only one electronic source
 - shows only one or two of the energy transformations
 - integrates text only in the web page, with considerable help

ILLUSTRATIVE EXAMPLES

SCIENCE, GRADE 12

SPECIFIC OUTCOMES

The student will be able to:

- | | | |
|----|-----|--|
| F1 | 4.3 | apply terminology appropriate to technology in all forms of communication |
| C1 | 4.1 | plan and perform complex searches using more than one electronic source |
| | 4.3 | evaluate and explain the advantages and disadvantages of various search strategies |

RELATED CURRICULUM OUTCOMES

Science 30, Unit 3, Concept 3, STS 5 and 6

- identify medical and industrial uses of gamma ray, X-ray and ultraviolet light technology to solve practical problems and advance scientific knowledge
- describe, in general terms, the use of radio waves, microwaves and infrared light in communications and remote sensing technology to solve practical problems and advance scientific knowledge

General Outcomes: F1, C1

STUDENT TASK

Background

A better understanding of the properties of the electromagnetic radiation (EMR) spectrum has resulted in the development of a variety of technologies to solve problems or advance scientific knowledge.

Task

Using three or more electronic references, research the use of a region of the EMR spectrum. Create a web page with this information to add to your school web page.

Include the following:

- list at least three different electronic sources
- describe the technology
- describe the specific properties of the EMR spectrum that makes it useful for application
- develop a means to evaluate the validity and reliability of the information sources that you have used to collect information
- describe how you would evaluate the validity and reliability of the information sources
- present this report, using appropriate software, to a general audience on the World Wide Web.

SCORING GUIDE

The student:

- | | |
|---|--|
| 4 | – lists and cites three or more electronic reference sources |
| | – integrates text, graphics, data tables, video/audio in the web page |
| | – evaluates and explains at least two advantages and two disadvantages of the different electronic sources |
| | – creates a web page, including text and graphics, and is able to upload to a web site |
| 3 | – evaluates and explains only two advantages and two disadvantages of the different electronic sources |
| | – creates a web page, including text and graphics, and is able to upload to a web site with assistance |
| | – integrates text, graphics, data tables, but no others in the web page |
| | – uses only two electronic sources |
| 2 | – uses only one electronic source |
| | – uses only text in the web page |
| | – evaluates but gives no explanation of one or two advantages and disadvantages of the electronic source |

- creates a web page, including text and graphics, but is not able to upload to a web site without assistance
- 1 - gives no evaluation or explanation of the advantages and disadvantages of different electronic sources
- creates a web page with considerable assistance but is not able to upload to a web site
- uses no electronic sources
- integrates text only in the web page, with considerable assistance

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